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EXPLORING THE INFLUENCE OF AUSTERITY ON THE SUSTAINABILITY PERFORMANCE DELIVERED WITHIN FOUR SPANISH HOSPITAL PROJECTS

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The economic recession in Spain (2008-2012) has resulted in a period of unprecedented austerity as the Government attempted to align with the requirements of EC financial aid. Budgets for new hospital projects were significantly reduced and many on-going projects forced to adjust their initial proposals to fit with the new economics. As the crisis eases this research seeks to explore the impact of the economic crisis on the priority placed on sustainability in new hospital projects during this period asking whether it was 1) perceived as a luxury against other priorities and removed, 2) retained purely as a requirement (i.e. CTE-2006) or 3) embraced as a driver to reduce operational lifecycle costs and if so to what extent did this go beyond energy. Four hospitals projects located in Pamplona (Navarra) reflecting a staggered timeline in their inception (before, during and after the economic crisis) are evaluated through a triangulation of methods (checklists, project documents and interviews) and a common evaluation framework based around BREEAM and CTE. Analysis revealed that sustainable measures which were regulated by legislation and those which have been proven to achieve an economic benefit over the buildings lifecycle have been retained and implemented despite the budget cuts.

Keywords: hospitals projects, sustainable construction, Spanish economic crisis

INTRODUCTION

Between 2007 and 2009, after years of prosperity, the Spanish economy suffered a GDP decline of -7.5%, the highest in history. As a consequence, the construction industry collapsed due to the lack of Government liquidity and the lack of credit for private investors. Since 2008 public spending has been declining each semester at the request of the Economic European Community as a condition to continued financial aid from its European partners. The trend of continued economic recession reached historical declines in GDP with an unemployment rate of 27% at the end of 2012 (INE, 2017). New construction projects have not been carried through and ongoing projects have experienced cuts of up to 40% of the initial budget. In this context, the potential exists in the few projects taken forward for the inclusion of sustainable measures to be downgraded and even removed due to the perception of cost and additional project risk. On the other hand, sustainable design has the potential for both environmental and economic benefits when considered across the whole life cycle of the building thus reducing both the operational energy costs for public buildings but importantly contributing to the wider Governments CO2 reduction targets. Indeed, despite this period of economic austerity Spain still requires to align with the European Directive

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(202/91/CE) on energy performance of buildings (OJEC, 2003) which has been adapted since 2006 through Spanish legalisation forming the Technical Edification Code (CTE) stipulating the promotion of sustainable design within buildings to improve its energy performance and reduce resource consumption (CTE, 2006). This commitment has promoted awareness of sustainability amongst public and private sectors, and is further emphasised by green building certification schemes such as BREEAM and LEED. The promotion and standardisation of good practice in sustainable design, aligned with the availability of innovative products is increasingly reducing the associated costs. Despite this, the perception is retained amongst many construction professionals that sustainable design and construction represents a luxury not deliverable during times of austerity and social hardship (Rotherham, 2010).

Prior to 2008, financial support was being offered to build and retrofit buildings helping them reach A or B energy ratings, and a requirement set within the Plan for 2008-2012 for energy efficiency through the public procurement of buildings (IDAE, 2007). However, similar to the UK's Code for Sustainable Homes (which was discontinued in 2015) the pressures caused by the collapse of the Spanish economy resulted in the majority of these grants disappearing. In 2004, Spain's held the status as having the highest rates of solar energy in EU with the highest rates of subsidies for promoting photovoltaics through RD 436/2004 (BOE, 2004). The financial crisis has led to the repealing of the legalisation as part of RD 1578/2008 reducing grants and penalising those who had already had solar installations, a practice heavily criticised by Spain's National Energy Commission.

At the beginning of the crisis, the Government tried to boost the economy with an injection of funding for public projects (Forcada, 2013), but by 2009 investment had collapsed as government expenditure was adjusted to align EU funding requirements, in addition to stringent tax increases (Hunter and Sim, 2012). Many public building and infrastructure projects were cancelled or halted but ongoing projects were adjusted with their initial proposals and their budgets fitting the new economic and political scenario. Although recent economic data shows an improvement in the Spanish economy; high unemployment and corruption currently clouds the country's economic reality with society demanding transparency and accountability for public expenditure (INE, 2015).

Austerity, Sustainability and Hospital Projects

Hospital projects provide the context for this research and have attracted a high level of public scrutiny over expenditure levels with many projects being cancelled, reduced in scale or even suspended. In May 2015, the Government announced the resumption of seventeen hospital projects with an investment of 1,400 million of euros (Sanchez de la Cruz, 2014), with many within the health sector believing that this was only an electoral hook (ISANIDAD, 2014). However, it is true that some stalled projects have recently been continued and completed, and other buildings that were closed due to lack of capital have also been recently re-opened. Despite the recovery, the Spanish Government will continue with austerity policies over the coming years shaping the context within which decisions relating to promoting sustainability are framed.

Hospitals represent a key context when considering the implications of austerity on decisions taken to invest on sustainability measures in public projects. The traditional association of sustainability measures and technologies with high upfront costs, additional risk and uncertain payback periods remains in both the public sector and construction industry and the potential exits for this perception to be heightened during a period of austerity with the safe traditional option preferred. Despite this, there is growing

recognition that investing in sustainability measures has the dual benefits of achieving savings on the operational energy costs and in contributing to the reductions in the aligned CO₂ emissions' targets (Griffiths, 2006). This has significant implications for hospitals due to their continuous use (365 days and 24 hours) and hygienic requirements resulting in buildings having a high demand of energy and water. The introduction of the CTE (2006) has seen sustainability measures being included and becoming mandatory for new buildings and large refurbishment, and this applies to hospital projects. Initially the Spanish Promoters and Builders Association criticized this code because it involved an increment in the price of projects, especially problematic in a crisis scenario. The Spanish Association for the Quality (AEC) also pointed that construction costs increased 10% due to CTE, in addition to the surface increment for service areas and the insulation of new requirements (LARCOVI, 2008). However, the decline in labour prices and standardization of products demanded by CTE, has eliminated these extra costs (Eustat, 2015). Evidence from housing related research suggests that in Spain, CTE has had a positive impact with one block of flats presented as a case study seeing 33.9% of energy savings.

There is to date little empirical evidence from the hospital sector to support a similar positive story demonstrating cost savings in practice during this period of austerity (Legido-Quigley *et al.*, 2013). When investment decisions are placed in such a challenging context it is important to ask whether the whole life value of the investment is recognised by decision makers (Kirkham and Boussabaine, 2005). IPSOM Consultants (2012) confirm that most hospitals could save 50% of their running costs with the appropriate application of sustainable measures. WRAP (2015) in the UK cite that 'life maintenance and operational costs of buildings can be five times greater than construction costs', highlighting the importance of efficient services and sustainable materials in new buildings. Hospitals are usually owned by the same organisation across the lifecycle so the potential exists to realise the benefits of the initial investment (Campion *et al.*, 2016). Despite apparent recognition, the question remains over whether the scale of the austerity crisis has translated into decisions supportive of investment in sustainability or whether the traditional perception prevailing in practice of it as a luxury? If sustainability is now a required consideration for hospital projects, a further question exists over whether it is viewed specifically in the context of reducing operational costs through energy savings with carbon savings regarded as a by-product; or does it extend to a more holistic understanding of sustainability in the built environment?

RESEARCH AIM

To answer these questions, this research adopts a case study approach with four hospital projects located in Pamplona (province of Navarra), a region of the North of Spain which suffers an extreme seasonal climate. These longitudinal case studies have been chosen to reflect a time line from their inception to represent a mix of projects making key project decisions before, during and in the later stages of the crisis in order to consider the impact of the recession on the priority placed on sustainability within project decisions, to explore cost implications, perception of clients and other stakeholders, influence of legalisation changes, level of innovation or the promotion of specific sustainability measures. This will allow for comparison to assess whether there has been a shift in the way sustainability has been perceived during this timeframe and whether it is viewed during decision making in a positive or negative manner within an austerity focused context.

RESEARCH METHODS

This research is based on the study of four hospital projects in a longitudinal approach reflecting approaches to investing in sustainability before, during and after the Spanish economic crisis. The case studies also were selected to reflect the same city, climate, and a mix of private and public ownership. Pamplona is selected for two reasons; 1) it is one of the few towns in Spain that had several large hospital projects in between 2000-2015 and 2) this is the place where the lead author enjoyed access to project information and stakeholders due to her professional role working with a local construction consultancy managing the bidding and procurement of each project. Table 1 provides a description of the characteristics of each showing a mix of private and public funded projects and start dates. A pragmatic approach is adopted reflecting the researcher's desire for inductive research which seeks to explore practice and allow questions to emerge to shape the findings. The starting point of the research emerged from professional concerns and intuition as to what was happening in practice.

Empirical evidence was sought through the research favouring an exploratory and explanatory approach which builds on her professional understanding in order to provide context and ask the right questions. The case studies are explored through mixed methods focused on an iterative process combining project observation and a checklist of information requirements (drawing on project documents, drawings, and available data relating to costs, projected operational performance and level of sustainability investment). In depth interviews with key stakeholders relating to each project (architects, engineers, client representatives, estate managers, construction project managers) explored the questions emerging from the analysis using thematic analysis, with a questionnaire used to access individuals who were unable to conduct a face to face interview with a view to obtaining specific information. The methods applied permitted strong use of triangulation. This was permitted through the lead author's access to the data and wider contextual understanding of the projects.

An evaluation of the aspects of sustainable construction implemented provided a consistent framework across the four projects around which each were investigated against the themes of the technical handbook of BREEAM New Construction for Non Domestic Buildings (SD5073 - 2.0:2011). Despite increased awareness in practice in Spain of this assessment method and a tailored version BREEAM Spain (2013), only two hospitals have implemented the BREEAM certificate with modest results of GOOD or VERY GOOD (BREEAM Spain, 2014). Therefore, this research doesn't conduct an evaluation of an existing assessment but merely uses the criteria to allow evaluation of each case study against a consistent framework. Using professional judgement and access to relevant data the implications of the sustainable design and wider measures were costed (reflecting initial cost, and implications for operational costs) as well as reflecting on the timeline of the project process and the reasoning for changes which took place in terms of investment for delivering sustainable design. The research started in 2012 and completed in 2015.

SUSTAINABILITY EVALUATION OF HOSPITAL PROJECTS

The four case studies were evaluated considering documentation related to design and procurement, consideration of BREEAM technical handbook, CTE regulations and exploring the context of related decisions through interviews with key stakeholders. An analysis grid was developed using BREEAM categories and sub categories (Energy, Water, Materials, Waste, Management, Health and Wellbeing, Transport, Land use and

Ecology, Pollution) evaluating each project against the credit awards in the technical handbook.

Table 1: Characteristics of the case studies

Case study	Cost (sector)	Timeline	Nature of project	Comments
San Miguel Hospital	6 M Euro (Private)	2005-07	Building extension and refurb	The initial project was a retirement home attached to the hospital and ended up becoming in hospital rooms by the increase in patients due to the decline of public health.
Virgen Del Camino Hospital	8 M Euro (Public)	2009-11	New building for paediatric emergencies	The government gave priority to this project, because it was a lower investment and is already running.
Hospital De Navarra	21 M Euro (Public)	2009-14	New building for emergencies	The building began construction in 2010, but it took four years to complete due to lack of public funds.
San Juan De Dios Hospital	41 M Euro (Private)	2011-14	Renovation and new building	The project suffered budget cuts from the start of construction due to the lack of public support.

Energy

The interviews revealed that stakeholders are increasingly aware of energy consumption as a key consideration during decision making as the potential to achieve operational savings is recognised. Significantly comparison revealed that projects signed after 2006 demonstrated greater consideration of low/ zero carbon technologies and promotion of solar panels and co-generation systems. The increased inclusion of low consumption external and internal lighting, transition to LED lighting, motion sensors, and importantly in the two later projects embracing principles of daylighting through measures such as internal gardens. It is clear that the introduction of CTE in 2006 has been a key determinant in the investment and inclusion of these measures, with those signed after 2006 all aligning to a strengthened energy criteria. As well as legislation acting as a driver for this, it was apparent that stakeholders recognised that there was evidence of the benefits due to reducing costs of the technologies and recognition for reducing operational costs which was seen as an increasing priority when it came to making energy related decisions.

Water

Awareness of water savings is widespread among developers and the general public in Spain. Consequently, most taps and WCs available in the market have water saving systems. Therefore, these measures can be included in projects without any increment on the budget. Despite this wide spread acceptance of its value, in the Navarra hospital with water saving features heavy in the original project proposals, the most expensive devices were discarded in the construction phase. Interviews revealed that unlike with energy, legislation such as CTE does not extend to improving water consumption within a sustainable design so when costs require to be reduced then these features become vulnerable. However, even without legislation driving the change evidence was presented through the interviews that stakeholders are recognising that advances in water saving technology is reducing costs year after year, and that contemporary projects are displaying a higher level of innovative water technology due to the stronger association with operational cost benefits. For this reason, the weakest project in relation to water is

San Miguel hospital and the best one San Juan de Dios. The interviews revealed a growing commitment towards the implementation of behaviour change programmes.

Materials

Despite a noticeable increase across the timeline of sustainable materials, the interviews revealed that this was not related to the ecological awareness of the designers, but rather was related to an appreciation by decision makers of the cost savings over the life cycle of the building achieved by using these materials or was seen as a need to comply with legislation covering their inclusion. The interviews revealed that the dominant consideration relating to materials is to promote robustness, with the associated link to ecological design which is low in terms of its priority. It is noteworthy that only San Juan de Dios Hospital project is designed with recycled materials, which are recognised as being more expensive but were seen as a big part of the design concept. In other projects priority was given to ecological materials which were proven to save money and stakeholders when asked felt that the crisis was indirectly affecting the decision making within the projects. CTE legislation was crucial in encouraging the improving isolation levels observed and a big difference was noted with the pre-2006 San Miguel Hospital.

Waste

The interviews revealed that the key driver for waste management during project decision making related to both general and specific legislation. San Juan de Dios hospital is the only project with separating containers for the recycling of specific site materials. Projects signed post CTE in 2006 showed an increase in the level of waste management consideration in the criteria with San Miguel Hospital emerging as the weakest project as a result.

Management

Most of the clients have taken into account sustainability in project procurement, and the interviews revealed that this was a bigger consideration during the design stage within each project. Comparison revealed that there were not big differences between the projects when considering performance against BREEAM criteria, and that the introduction of CTE legislation had no influence on management processes. However, it is true that San Juan de Dios hospital as the most contemporary project achieved the highest rating and actively considering analysis of the cost and savings of sustainable measures during decision making.

Health and Wellbeing

The interviews revealed that this is an aspect that has been taken into account within all of the hospitals, both private and public. The private hospitals, San Miguel and San Juan de Dios are located in a green area and both have been designed to ensure that the stay of patients in the hospital is more pleasant with attractive views which are aspects that are not part of a legislative framework. Indoor air and water quality, acoustic performance and safety are aspects where the designs are again conditioned by compliance with CTE regulations. San Juan de Dios hospital is the best building in this aspect it was revealed for two reasons; the good location and the owners' aim to get the best for its patients.

Transport

Hospitals located in the outskirts of the city have the advantage of having a greener and more pleasant environment for patients, but they have the disadvantage of having poor transport connection, amenities, and travel plan. The absence of bike lanes and low frequency of public transport, invite the use of private vehicles to get to both private hospitals which are out of town. The interviews revealed that these are factors where austerity limits the solutions emerging from local authority as they struggle to provide a

more sustainable transport infrastructure and also starving funding to support incentives directly by the hospitals.

Land use and ecology

San Juan de Dios Hospital is especially sensitive to this aspect because the expansion of the building is in an area of garden and orchard belonging to the religious community who own the hospital. The interviews revealed that this project placed emphasis on an ecological design and strong connection between land and wellness of patients. The other three projects are located in places of less ecological significance and with the exception of tree protection, with no further action imposed by law. The interviews revealed that unless sustainability measures are addressed within legislation, then decision makers will not consider these.

Pollution

Hospitals can be defined as high polluting buildings. They produce tonnes of waste, refrigerants for air conditioning and laboratories and NO_x emissions from central heating boilers. The interviews across the projects revealed that whilst they try and comply with legislation minimums, there is not a big commitment to improve these aspects beyond this. The key drivers are again the compliance with regulations (i.e. CTE and other regulations) and the technology advancement which is driving improvements and cost reductions. The latest projects include modern boilers, as well as the most efficient noise isolation and display a big advance compared to the older ones, again the interviews revealed that austerity did not limit their inclusion as there was an obvious operational cost saving.

FINDINGS AND DISCUSSION

The economic crisis began in Spain in the year 2008, but it was in 2010 when at the request of the CEE, a strong campaign to constrain public spending began. San Miguel Hospital started its activity at the end of 2007, still representing the boom of the Spanish economy and as a result this project was not affected by the drawback of the economy. However, the two public hospitals were directly affected by the deep cuts in public spending with both projects reducing the useful area of buildings and experiencing delays. In the case of Virgen del Camino Hospital, the construction phase experienced delays due to an inability to adapt to the monthly payments to the Government of Navarra. The Navarra Hospital, suffered 29 months of delay in opening the building, due to the lack of public money for the equipment expenditure. The austerity policy also affected the private hospital San Juan de Dios. This hospital had planned a co-generation system, which was removed from the project when the Government slashed subsidies for renewable energies. The private company that would have managed the co-generation system abandoned the project because it was considered unprofitable without the subsidies. But the project needed to comply with CTE regulations in relation to renewable energy sources and consequently the warm double roof was changed for a gravel roof that allowed the installation of solar panels.

The projects were evaluated depending on the featured sustainable measures against each of the BREEAM categories ranking the hospitals (4-Best, 3-Good, 2-Bad and 1-Worst). The newest hospital (San Juan de Dios) is the best rated hospital with an average of 3.78, with Navarra hospital next with (3.0), followed by Virgen del Camino (2.23) and San Miguel (2.09) hospitals. This highlights the evolution of sustainable design and technologies from 2005 to 2011 and also makes clear the high level of sustainability across all projects with all achieving high scores for certain criteria and an overall rating over 50%. These findings can be aligned to the cost analysis displayed in Table 2

illustrating the project budget, investment in sustainable elements outlined in the design phase and the real investment achieved for sustainability. This reflects the reduction in investment for San Juan de Dios hospital in cogeneration solutions due to removed subsidies thus reducing the real sustainability investment by nearly half. This project showed that despite an overall increased appreciation of the value of sustainable features in a project, when the lifecycle costs do not represent good value then it remains a luxury item and will be cut. However, despite this it remained the strongest project in the review and was the most contemporary. Despite the bad position on the hospitals ranking, the San Miguel project team demonstrated awareness of the latest sustainable measures and included insulation and service measures higher than those required by regulations.

Table 2: Cost analysis of the four projects (in Euro)

Hospital	Project Budget	Sustainability investment	%	Real investment	%
San Miguel	6.000.000	223.000	3.7	223.000	100
Virgen del Camino	5.847.075	406.259	6.9	406.259	100
Navarra	21.000.000	1.531.900	7.3	1.531.900	100
San Juan de Dios	41.000.000	4.005.312	9.8	2.230.014	56

Three broad themes emerged as drivers for inclusion of sustainability: 1) compliance with legislation, 2) growing stakeholder ecological awareness and 3) association of innovative technologies with operational lifecycle savings.

The significance of legislation and the marked change in practice following the introduction of CTE (2006) has been the clearest driver for sustainable design. The interviews revealed that in projects which remained active during the recession, features associated with the CTE were independent of the impact on austerity on decision making. However, it was clear that perceptions of the increased costs associated may have contributed to some projects being stalled or cancelled. A greater association with the regulation changes and operational cost savings has seen this perception become less influential amongst decision makers especially hospital project managers. Analysis of the projects in relation to the BREEAM criteria revealed that investment in sustainable measures is was predominantly focused on aspects which promote operational costs of the buildings, such as increased insulation, low energy lights or heating systems with renewable or low energy consumption. It seems this link has enabled decisions to be taken to support investment, but has also resulted in reductions of CO₂ levels during the life cycle of the building.

The next key theme is the increasing ecological awareness of hospital managers and project teams. This can be seen in San Juan de Dios hospital which had the highest sustainability rating for the building and reflects large differences when compared to the others. As a private hospital, evidence from the interviews suggested that they have easier access to funds than public projects but importantly it also seeks customers and this has seen sustainability emerge as part of their marketing strategy. Public hospitals are showing little progress in advancing criteria outside of the CTE due to spending cuts, and have a wider problem to resolve associated with growing waiting lists. The private sector is becoming an option for those with wealth and is a growing market with their sustainability credentials seen as an important attraction.

The last theme reflects the role played by innovation and a maturing market for sustainable processes and materials in the evolution of the projects in a more sustainable way. The interviews revealed that this evolution is driven by a mix of compliance with legislation, the ecological awareness of stakeholders and technological advancements and

economies of scale observed through standardisation, with these allowing designers to include more sustainable measures for a lower price.

CONCLUSIONS

The levels of austerity seen in Spain since the economic crisis of 2008 have had a strong impact on hospital projects with many being cancelled, delayed or reduced in scale. The four projects explored in this research reveal that the economic situation has influenced the development of each with investment in sustainability actually increasing in the more contemporary projects. To many of the stakeholders who were involved in delivering the projects, including the lead author, this finding came as a surprise due to the dominant perception that the crisis would have seen sustainability features within a project as very vulnerable to budget cuts due to the common view that they were often expensive and seen as a luxury during times of austerity. The analysis revealed that the crisis has helped to focus design decisions on reducing operational costs of the buildings and this has led to sustainable design and construction measures being implemented to achieve whole life goals. It can also be argued that this context has been supported during this timeframe through the changes to the regulations through the CTE legalisation in order to achieve sustainability objectives set by the EU.

The economic crisis has affected the development of the projects, but not the mandatory sustainable measures which evidence suggests are helping to reduce operational costs although perceptions amongst all stakeholders haven't yet fully acknowledged this. The San Miguel hospital was initiated during times of prosperity and when the crisis hit the stakeholders decided to even improve it by incorporating even more efficient services. This was a private project, and by contrast both public projects (Navarra and Virgen del Camino hospitals) suffered heavy cuts in addition to delays. However, despite this contrast in fortunes when compared to the private project most of the sustainable design elements were maintained when budget cuts were undertaken, and this reflected their inclusion as a requirement as part of the CTE legalisation. Despite the crisis, the level of investment in sustainability elements was still increasing. San Juan de Dios hospital was the most recent and analysis revealed that it was the most sustainable project in terms of intended budget; however it did suffer from the elimination of renewable energy subsidies resulting in the removal of the co-generation system and double roof from the design. This however was not because of a lack of funds but a view from the stakeholders that due to the national removal of the subsidies the whole life economic case didn't justify the initial cost. This reminds us that austerity has created a culture where the economic case has to be met in order to support the inclusion of sustainable features in a project beyond legislative requirements. Despite the improved economic picture in Spain, public health expenditure continues to face a challenging future. Despite this, decision makers are recognising the potential benefits of sustainability and are prepared to invest in it but only when it is associated with improved operational cost benefits (Adams *et al.*, 2014; Sahamira and Zakariab, 2014).

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